held in Seoul in January 2018.

[구 EAO-03] Subaru-EAO international partnership

Michitoshi Yoshida
Subaru Telescope, NAOJ

The Subaru telescope is a 8.2m optical-infrared telescope operated by National Astronomical Observatory of Japan since 2000. Its wide field observation capability with good image quality makes the telescope one of the best astronomical facilities. We Subaru Telescope is seeking for international partners for the telescope operation to share science observations, future strategy and development. In the course of this effort, EAO and us exchanged a letter of intent on the planning of collaboration on the Subaru operation in this June. I introduce the contents of the Subaru-EAO LOI and the basic concepts of the Subaru international partnership in addition to a brief report of the current status of the observatory.

[구 EAO-04] From SMA to w-SMA

Naomi Hirano and SMA team
ASIAA

The Submillimeter Array (SMA) has provided forefront capabilities for high spatial and spectral resolution observations at submillimeter wavelengths from its excellent site on Mauna Kea, Hawaii since 2004. The SMA has continuously enhanced its capability. It is now equipped with two receivers in the 1.3 mm band (Rx230/Rx240) and two in the 0.85 mm band (Rx345/Rx400). The total bandwidth available is 8+8 GHz (per receiver) in the dual band or polarization mode. To maintain a leading role in the ALMA era, the SMA project is now upgrading its receivers, IF signal transport and correlator system. The new wideband SMA - the wSMA - will provide the instantaneous coverage of 56 GHz. In this presentation, I will introduce the latest status of the SMA, upgrade plan to the w-SMA, the possible science cases with the w-SMA, and the roles of the w-SMA in the ALMA era.

[구 EAO-05] Activities of East Asian VLBI network

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We will present the activities of East Asian VLBI Network, EAVN, which consists of around 20 radio telescopes in Japan, Korea, and China with 6,500 km extend. It is a most sensitive and highest VLBI array in the world. We have conducted science verification observations at mainly 8 and 22 GHz. And Japanese VLBI array, VERA, and Korean VLBI array, KVN have combined as KaVA, Korean and VERA Array, and started science observations with open use at 22 and 43 GHz. We will presents some commissioning and science results based on it. Moreover Taiwan is constructing the Greenland telescope to be a millimeter and submillimeter VLBI station, which will be a very powerful station in Global millimeter and submillimeter VLBI array. These activities will be introduced as well.

태양/우주과학

[구 SS-01] Quantitative Characterization of Solar Active Regions Based on Their Evolutionary Paths

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We present a way of quantitatively characterizing solar active regions on the basis of their evolutionary paths. To determine characteristic properties of active regions with different sizes and configurations, we use a physics-based model to derive a relation between emerged magnetic flux and injected magnetic helicity (Flux-Helicity relation), the former of which gives scale information while the latter represents the magnetic field configuration of an active region. We demonstrate how this relation provides evolutionary paths of active regions and determines their characteristic properties, through a comparison with modeled active regions obtained from magnetohydrodynamic simulations.

[구 SS-02] Development of a Daily Solar Major Flare Occurrence Probability Model

Based on Vector Parameters from SDO/HMI

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We present the relationship between vector magnetic field parameters and solar major flare occurrence rate. Based on this, we are developing a forecast model of major flare (M and X-class) occurrence rate within a day using hourly vector magnetic field data of Space-weather HMI Active Region Patch (SHARP) from May 2010 to April 2017. In order to reduce the projection effect, we use SHARP data whose longitudes are within ±60 degrees. We consider six SHARP magnetic parameters (the total unsigned current helicity, the total photospheric magnetic free energy density, the total unsigned vertical

current, the absolute value of the net current helicity, the sum of the net current emanating from each polarity, and the total unsigned magnetic flux) with high F-scores as useful predictors of flaring activity from Bobra and Couvidat (2015). We have considered two cases. In case 1, we have divided the data into two sets separated in chronological order. 75% of the data before a given day are used for setting up a flare model and 25% of the data after that day are used for test. In case 2, the data are divided into two sets every year in order to reduce the solar cycle (SC) phase effect. All magnetic parameters are divided into 100 groups to estimate the corresponding flare occurrence rates. The flare identification is determined by using LMSAL flare locations, giving more numbers of flares than the NGDC flare list. Major results are as follows. First, major flare occurrence rates are well correlated with six magnetic parameters. Second, the occurrence rate ranges from 0.001 to 1 for M and X-class flares. Third, the logarithmic values of flaring rates are well approximated by two linear equations with different slopes: steeper one at lower values and lower one at higher values. Fourth, the sum of the net current emanating from each polarity gives the minimum RMS error between observed flare rates and predicted ones. Fifth, the RMS error for case 2, which is taken to reduce SC phase effect, are smaller than those for case 1.

[구 SS-03] Application of Convolution Neural Network to Flare Forecasting using solar full disk images

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In this study we apply Convolution Neural Network(CNN) to solar flare occurrence prediction with various parameter options using the 00:00 UT MDI images from 1996 to 2010 (total 4962 images). We assume that only X, M and C class flares correspond to “flare occurrence” and the others to “non-flare”. We have attempted to look for the best options for the models with two CNN pre-trained models (AlexNet and GoogLeNet), by modifying training images and changing hyper parameters. Our major results from this study are as follows. First, the flare occurrence predictions are relatively good with about 80 % accuracies. Second, both flare prediction models based on AlexNet and GoogLeNet have similar results but AlexNet is faster than GoogLeNet. Third, modifying the training images to reduce the projection effect is not effective. Fourth, skill scores of our flare occurrence model are mostly better than those of the previous models.

[구 SS-04] Application of Deep Learning to the Forecast of Flare Classification and Occurrence using SOHO MDI data

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A Convolutional Neural Network(CNN) is one of the well-known deep-learning methods in image processing and computer vision area. In this study, we apply CNN to two kinds of flare forecasting models: flare classification and occurrence. For this, we consider several pre-trained models (e.g., AlexNet, GoogLeNet, and ResNet) and customize them by changing several options such as the number of layers, activation function, and optimizer. Our inputs are the same number of SOHO)/MDI images for each flare class (None, C, M and X) at 00:00 UT from Jan 1996 to Dec 2010 (total 1600 images). Outputs are the results of daily flare forecasting for flare class and occurrence. We build, train, and test the models on TensorFlow, which is well-known machine learning software library developed by Google. Our major results from this study are as follows. First, most